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Drug Dissolution and it's Effect

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ABSTRACT

The scientific study of drug has been extending the physical condition of drugs to solid, liquid, and gaseous form. A drug is an agent used in diagnosis, cure and prevention of diseases in man or in animals. Drugs are the substance which changes the functionalities of human and animal bodies by once get into the bloodstream. Diversity in their action and effect in the subject body is the main important characteristic feature. In this regard, rate of dissolution of drugs in three conditions i.e. acid, basic and neutral is studied.

Keywords: Drug dissolution, rate of drug, dissolution ibuprofen.

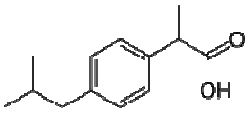
INTRODUCTION

Ibuprofen is the type of mostly used drugs. Ibuprofen is often used as a NSAID. NSAID is abbreviation for non steroidal anti - inflammatory drugs. It is prominent used to relief symptoms of arthritis or fever. Basically, Ibuprofen acts as an analgesic or pain reliever, it often comes in capsules, tablets, or powder form. Its effects are due to the inhibitory actions on cyclo - oxygenases, which are involved in the synthesis of prostaglandins. Prostaglandins have an important role in the production of pain, inflammation and fever.

In the year 1969, Ibuprofen is known as a carboxylic acid that was first found in the United Kingdom by Boot Pure Drug Company in the name of Brufen.

IUPAC name of brufen is (2RS) – 1 [4 – (2 – methyl propyl) pheny] propionic acid. Ibuprofen comes in different forms as pain reliever and is seen under a variety of popular trademarks.

STRUCTURE:



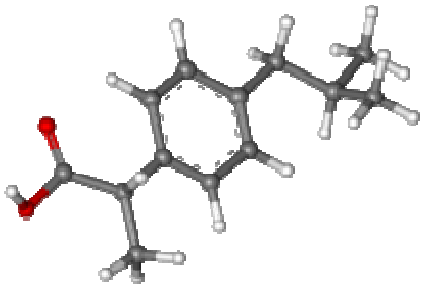


Fig.1 Structure of ibuprofen

PREVENTION PRINCIPLE

These principles are intended to help parents, educators and community leaders think about, plan for deliever research-based drug abuse prevention programs.

RISK FACTORS AND PROTECTIVE **FACTORS**

Principle-1: Prevention programs should enhance protective factors and reverse or risk factors.

- The risk of becoming a drug abuser involves the relationship among the number and type of risk factors (eg – deviant attitudes and behaviors) and protective factors (eg – parental support).
- Early intervention with risk factors often has a greater impact than later intervention by changing a child's life path away from problems an dtowards positive behaviour.

Principle-2: Prevention programs should address all form of drug abuse, alone or in combination, including the under age use of legal drug (eg – tobacco or alcohol) the use of illegal drugs (eg – heroin or marijuana) and the in appropriate use of legally obtained substances (eg – inhalants), prescription medication, or over the counter drugs.

Principle-3: Prevention program should address the type of drug abuse problem in the local community, target modifiable risk factors and strengthen identified protective factors.

Principle-4: Prevention program should be included the effective training centre.

Principle-5: The reinforcing skills of drug are mostly interactive technique.

DRUG DISSOLUTION RATE

Dissolution is a process by which a compound goes from the solid state into solution in a solvent.

The rate of dissolution is a key target for controlling the duration of a drug's effect, and as such, several dosage forms that contain the same active ingredient may be available, differing only in the rate of dissolution. If a drug is supplied in a form that is not readily dissolved, the drug may be released more gradually over time with a longer duration of action. Having a longer duration of action may improve compliance since the medication will not have to be taken as often. Additionally, slow – release dosage forms may maintain concentrations within an acceptable therapeutic range over a long period of time, as opposed is quick – release dosage forms which may result in sharper peaks and troughs in serum concentrations.

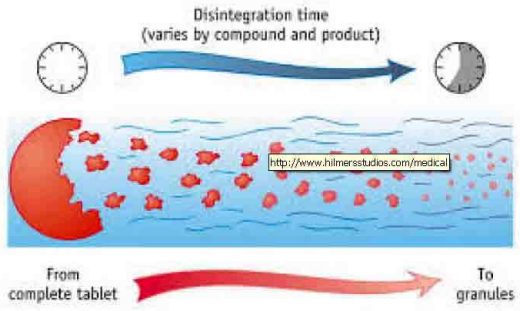
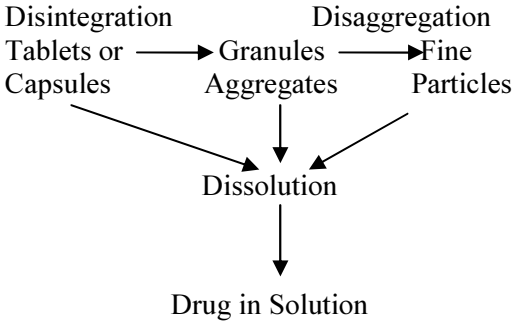


Fig. 2 drug dissolution

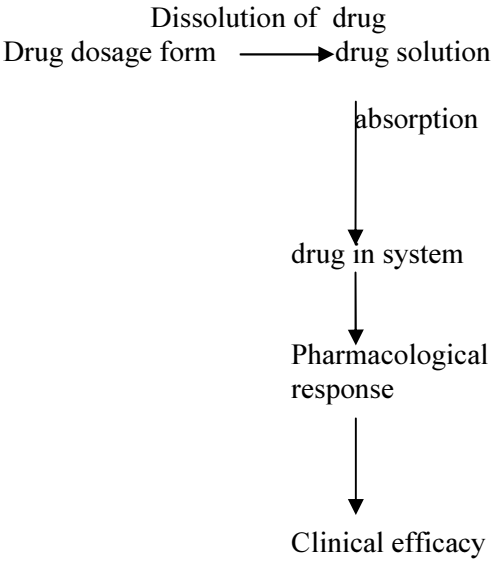
DISSOLUTION AS A PROCESS



DRUG DOSAGE

In solution dosage forms, the drug is already dissolved in the product, and is available for absorption immediately after administration to a patient. However, in other types of dosage forms (tablets, capsules, suspensions, and so forth), the drug is present as a solid. Before the drug can be absorbed or reach its target, it must be released from the dosage form; in other words, it must dissolve in the fluids at the site of absorption. Undissolved drug cannot be absorbed. Even if the drug product is intended for local action and does not require systemic absorption, dissolution is necessary for the drug molecules to reach the site of action and interact with the target. If the drug does not dissolve completely, the amount of drug available for absorption or action will be less than the dose administered.

Dosage Form:
the form of the completed pharmaceutical product eg – tablet, capsules, injection etc.



DRUG MOVEMENT

In pharmacology, absorption is the movement of a drug into the blood stream. In the most standard situation, a tablet is ingested and passes through the esophagus to the stomach. Aqueous environment of stomach tablet of Ibuprofen will dissolve first in body.

When a drug particles enters in body it dissolves a thin layer of liquid, which is known as diffusion layer or stagnant layer. This layer remains stagnant or unmixed, while the bulk liquid in the solution is

completely mixed. At the solid/liquid interface, the drug dissolves rapidly forming a saturated solution. The overall rate of dissolution is governed entirely by the diffusion of dissolved drug molecules through the stagnant layer from solid surface to the bulk liquid.

Thus absorption is a primary focus in drug development and medicinal chemistry. Since the drug must be absorbed before any medicinal effect can take place.

REQUIRED CHEMICALS

Tablet of ibuprofen, pH4 solution, pH9 solution, distilled water.

PROCEDURE

In physiological condition the tablet is physiologically differ in mode of absorption. For controlling the duration of a drug effect rate of dissolution play the major role. This study focus on the rate of dissolution under acid, basic and neutral condition.

For this study first distilled water is taken in eight beakers. Now tablet of ibuprofen is crushed and measured in digital balance and put into the beakers containing distilled water. After each 30min. each beaker solution is filtered one by one. Then, filter papers are dried upto 24 hours. The undissoluted drug is measured by chemical balance and thus reading is observed.

Same process continued with pH4 and pH9 solution and it's dissolution on them is observed.

OBSERVATION TABLE

I. Table for dissolute drug in case of distilled water

Name	Wt. Before dissolution	Initial time	Final time	Amount of drug Dissolute	wt. of drug undissolute	Rate of dissolute
Tab1	0.532mg	10.00am	10.30am	0.426	0.143	74.86%
Tab2	0.562mg	10.00am	11.00am	0.451	0.118	80.39%
Tab3	0.532 mg	10.00am	11.30am	0.445	0.099	81.80%
Tab4	0.554 mg	10.00am	12.00pm	0.436	0.101	81.19%
Tab5	0.537 mg	10.00am	12.30pm	0.461	0.093	83.21%
Tab6	0.544 mg	10.00am	01.00pm	0.434	0.098	81.57%
Tab7	0.561 mg	10.00am	01.30pm	0.437	0.125	77.25%
Tab8	0.569 mg	10.00am	02.00pm	0.443	0.089	83.27%

II. Table for dissolute drug in case of pH-4 solution

Name	Wt. Before dissolution	Initial time	Final time	Amount of drug Dissolute	wt. of drug undissoluted	Rate of dissolute
Tab1	0.519mg	10.00am	10.30am	0.312	0.207	59.73%
Tab2	0.570 mg	10.00am	11.00am	0.401	0.169	70.35%
Tab3	0.566 mg	10.00am	11.30am	0.420	0.146	74.20%
Tab4	0.570 mg	10.00am	12.00pm	0.415	0.155	72.81%
Tab5	0.557 mg	10.00am	12.30pm	0.402	0.152	72.17%
Tab6	0.573 mg	10.00am	01.00pm	0.431	0.142	75.22%
Tab7	0.544 mg	10.00am	01.30pm	0.410	0.134	75.37%
Tab8	0.573 mg	10.00am	02.00pm	0.456	0.117	79.58%

III. Observation Table for wt. of drug diluted in case of pH-9 solution

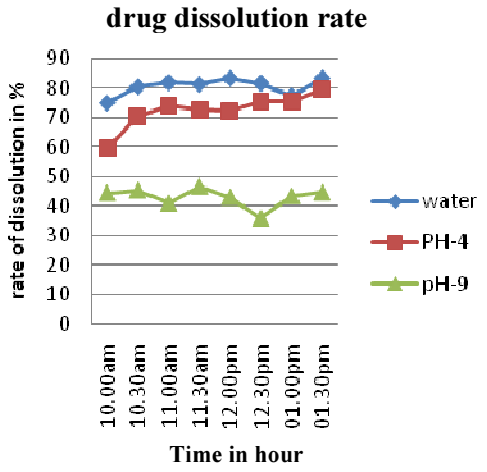
Name	Wt. Before dissolution	Initial time	Final Time	Amount of drug Dissolute	wt. of drug undissoluted	Rate of dissolute
Tab1	0.479mg	10.00am	10.30am	0.212	0.267	44.26%
Tab2	0.549 mg	10.00am	11.00am	0.248	0.301	45.17%
Tab3	0.552 mg	10.00am	11.30am	0.225	0.327	40.76%
Tab4	0.564 mg	10.00am	12.00pm	0.262	0.302	46.45%
Tab5	0.564 mg	10.00am	12.30pm	0.242	0.322	42.91%
Tab6	0.575 mg	10.00am	01.00pm	0.205	0.370	35.65%
Tab7	0.550 mg	10.00am	01.30pm	0.238	0.312	43.27%
Tab8	0.567 mg	10.00am	02.00pm	0.252	0.315	44.44%

CALCULATION

$$\text{Rate of dissolution} = \frac{\text{Weight of drug dissolute}}{\text{Total weight of drug (in solid state)}} \times 100$$

= Percentage of dissolution of drugs

GRAPH



CONCLUSION AND DISCUSSION

The rate of dissolution of ibuprofen was seen highest in water, i.e. in neutral condition. which means ibuprofen strongly dissolves in duodenum (small intestine) in human body. Where the pH changes to 7.0 – 8.5.

Dissolution of ibuprofen reaches 83% in duodenum. While in pH-4 and pH-9 solution it's dissolution reaches 79% and 46% respectively.

It is followed by pH4 and pH9. Which indicates that it is dissolves better in neutral medium.

By this test we can also enhance the dissolution rate of ibuprofen by appropriate substance.

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